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# Communications of the Association for Information Systems



## Information Systems Skills Differences Between High-Wage and Low-Wage Regions: Implications for Global Sourcing

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### Abstract:

Developing Information Systems (IS) skills for a company's workforce has always been challenging, but global sourcing growth has caused the determination of needed IS skills to be more complex. The increased use of outsourcing to an IS service provider and from high-wage regions to low-wage regions has affected what IS skills are required globally and how to distribute the workforce to meet these needs. To understand what skills are needed in locations that seek and those that provide outsourcing, we surveyed IS service provider managers in global locations. Results from 126 reporting units provide empirical evidence that provider units in low-wage regions value technical skills more than those in high-wage regions. Despite the emphasis on commodity skills in low-wage areas, high- and low-wage providers value project management skills. Low-wage regions note global and virtual teamwork more than high-wage regions do. The mix of skills and the variation by region have implications for domestic and offshore sourcing. Service providers can vary their staffing models in global regions which has consequences for recruiting, corporate training, and curriculum.

**Keywords:** information systems, information technology, human resources, service provider, skills, low-wage, high-wage, global sourcing, offshore outsourcing, offshoring, project management, business domain, technical, regional differences

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### I. INTRODUCTION

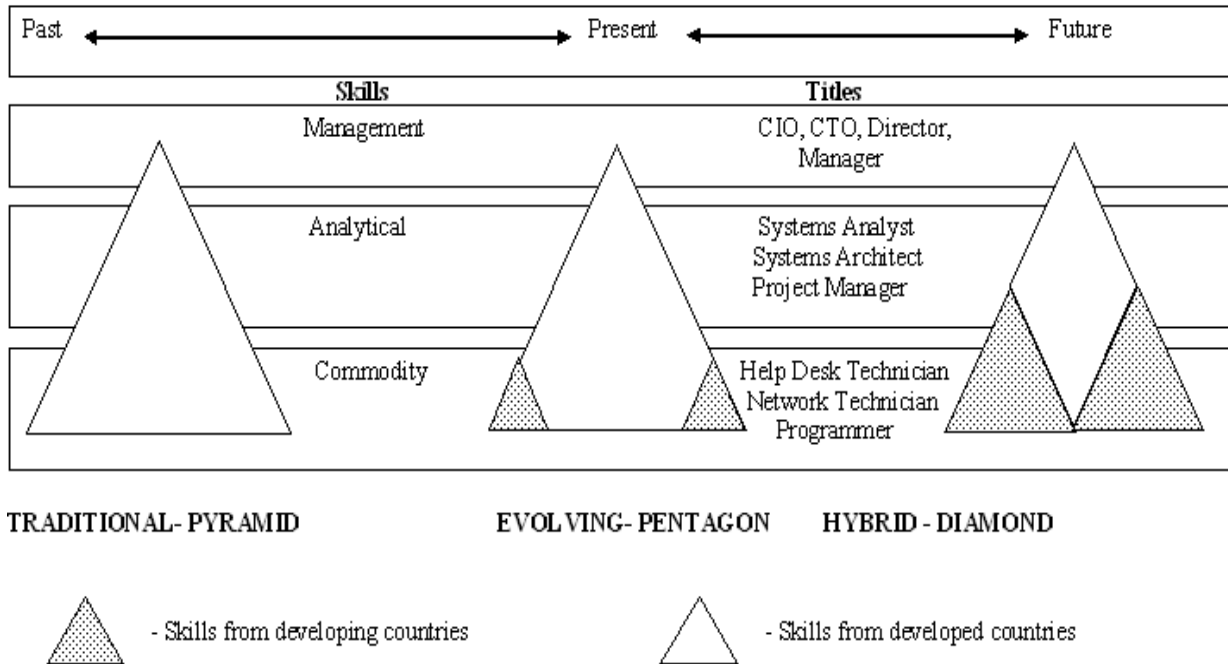
The growing trend toward global information systems (IS) sourcing reflects a natural progression of the outsourcing movement. The practice of using IS providers has been ongoing since the 1950s but gained more interest when Eastman Kodak outsourced its IS functions in the late 1980s with many megadeals following, such as General Motors' \$15 billion outsourcing deal for development of a single global Information Technology (IT) organization for its company [Hoover, 2006] and Johnson Diversey's transfer of infrastructure management [Hawk et al., 2009]. Although these large contracts capture media attention, there has been a decrease in megadeals (down 51 percent in the Americas in the second quarter of 2011) and an increase in multisourcing with smaller contracts, with the total value of outsourcing relatively unchanged [TPI, 2011]. Reasons for this indicate a maturation of the outsourcing market and clients' desires to insure more competitive bids and less reliance on a single vendor [Overby, 2011]. As global sourcing increases in volume and scope, it ushers in a combination of threats, opportunities, and change. This dynamic environment presents new challenges for organizations, managers, and IS professionals.

Foremost among these challenges is the need for IS workforce skills that will contribute to organizations' survival and success in the new environment. Observers have posited a "new world order" due to the increased use of offshoring and calls for changes in education to address future needs [e.g., Hirschheim, 2009]. In this "brave new world," skills are critical because they will help determine organizations' levels of performance in the future [King, 2007]. From an organizational perspective, the proper set of workforce skills enables organizations to make the best use of available technologies to identify, develop, and deliver effective solutions to business problems and offers opportunities anywhere in the world. Organizations can gain access to these skills by either maintaining an internal IT staff, contracting with one or more providers, or both. The issue is how to determine the right fit, not only for an organization but for its multiple locations, and how it can respond quickly to meet increasing demands for technology.

Historically, the unique character of IS professionals has been distinguished by technical expertise. Many of the highly technical skills employed by IS professionals require little interaction with non-IS staff. However, as technology became more user friendly and accessible to non-IS personnel (e.g., fourth-generation programming languages, website development tools, basic database software, simulation and modeling systems), the relative importance of technical skills is being questioned. Furthermore, the ability to find technical expertise throughout the world contributes to dispersing work such as coding, testing, and routine maintenance (i.e., installing patches and upgrades) that needs little user communication. This dispersal is motivated in part by labor arbitrage where firms benefit from a cost advantage when accessing technical skills in low-cost locations and a talent pool to address the shortage of some skills due to university enrollment problems.

One perspective on the impact of global IS sourcing on the workforce skill mix is a shift in the profile of the workforce in developed countries. Large consulting firms such as Accenture, IBM, Cap Gemini, and Infosys have a global presence, so one would expect them to maintain a portfolio of skills across global locations [Koh et al., 2010]. Other small and medium-sized firms are increasingly establishing a presence by attracting clients from high-cost regions while locating their workforce in low-cost regions. Even firms that retain much or all of their IS functions in-house are deliberating the use of captive centers in low-cost regions. The upshot of all this is that the traditional pyramid-shaped workforce is being transformed into a pentagon shape, with the expectation that it will become diamond-shaped in the future (see Figure 1). The base of the pyramid, representing standardized or "commoditized" jobs, often viewed as highly technical, such as straightforward programming, common network administration, and basic help desk functions, is more easily moved from developed, or high-wage, to developing, or low-wage, countries. More complex activities, such as application design and development, strategic architecture services, and project management, tend to remain in developed countries, at least for the time being [Aspray et al., 2006; Gray and Connolly, 2008].

The mix of IS skills needed to successfully support an organization no longer depends solely on a central location. The design of staffing models is threatened further by skill shortages in some parts of the world. The dispersion of skills across the globe mirrors manufacturing and supply chain skills that have migrated to developing countries. In fact, one can quickly obtain bids for almost any technical skill from across the world [Gefen and Carmel, 2008]. However, unlike the manufacturing and supply industries, there is a lack of evidence on the effect of offshoring on



**Figure 1. The Changing Profile of the Global IS Workforce (Adapted from Gray and Connolly, 2008)**

the IT workforce, in large part due to the insufficiency of existing data on this topic [Tambe and Hitt, 2010]. One objective of this article is to address that gap. Notwithstanding that, it must be stressed that this is an initial, exploratory look at a topic that cries out for a more in-depth and finer-grained study.

To investigate the implications of changes in the business environment on IS workforce skills, we undertook a two-phase multiyear multiorganization project that examined the changing nature and distribution of IS skill needs. Data were gathered from managers at both IS service providers and non-IS firms. Non-IS firms are clients of IS firms. Non-IS firms engage IS service providers and are not in the business of hardware, software, or providing development or IS consulting. We refer to these latter firms as *IS clients*, or simply *clients*. We targeted both developed (high-wage) and developing (low-wage) countries from small to large organizations. Results of our investigation and analyses are described in the paragraphs that follow.

## II. LITERATURE REVIEW

### Theoretical Perspective

The foundational theoretical perspective on global sourcing can be traced back over 200 years to Adam Smith's theory of absolute advantage: an entity has an absolute advantage if it can produce more of a good or service than any other entity, while consuming the same amount of resources [Smith, 1776].

In the specific context of global sourcing, the good or service being produced is some form of IS services. These services are generated through the performance of various tasks, which in turn can be categorized as "tradable," that is, they can be delivered via information and communications technology, and hence can be performed in any location with access to those resources [Tambe and Hitt, 2010]. The theory of absolute advantage postulates that these tasks will migrate to locations where they are performed with minimal costs, in particular labor costs, which make up the bulk of IT services costs [Gefen and Carmel, 2008].

There have been various schemes proposed to categorize the types of tasks most likely to be relocated (i.e., globally sourced). "Routine" tasks (well-defined tasks controlled by deductive rules) have been differentiated from "nonroutine" tasks (those requiring inductive reasoning and pattern recognition), with routine tasks being more suitable for offshoring than nonroutine tasks [Autor et al., 2002]. A similar categorization distinguishes between tasks based on "codifiable" information and those based on "tacit" information. Codifiable-based tasks are easier to explain and monitor than tacit-based tasks, and hence are more appropriate for offshoring [Levy and Murnane, 2004]. These categories parallel Hill's [1977, 1999] conceptualization of a continuum ranging from generic and undifferentiated tasks at one extreme to customized tasks at the other.

The combination of the theory of absolute advantage and the notion of tradable tasks can help explain the evolution of global sourcing depicted in Figure 1, from the performance of simple commodity tasks to the undertaking of more interactive and innovative activities. This suggests the emergence of a global market for higher-level and more complex IS services [Doh, 2005], which in turn has implications for the global distribution of workforce skills.

Literature and research about IS outsourcing has increased since the 1990s, but studies often focus on single case studies and management issues. Analysis of the IS outsourcing literature suggests that certain organizational capabilities of both clients and suppliers are linked with outsourcing success. Among these capabilities are the ability of client organizations to effectively manage outsourcing vendors, and the ability of vendors to grasp client organizations' business and technical contexts, processes, practices, and needs [Kim et al., 2010; Lacity et al., 2009]. These organizational capabilities arise from the individual skills of the firm's workforce, which is the focus of this study. For comprehensive reviews, see Dibbern et al. [2004] and Lacity et al. [2009] to review the issues investigated in the IS outsourcing literature. Neither of these reviews references regional differences. Goles et al. [2008] provide an overall comparison of IS skills between client and provider firms but do not provide data on regional differences. That study presents a preliminary investigation of the same data set, therefore accounting for the sample size differences. The current study reports on the final data set from that research effort with the primary focus on how skills differ between low-wage and high-wage regions.

### Global Skills Availability

The continued increase of global sourcing in both volume and scope seems inevitable [Aspray et al., 2006; Davis et al., 2006, Lacity and Hirschheim, 1993]. Early evidence indicates that there were no significant changes during the recession, but that the most important driver was reduced cost [Kraemer et al., 2010]. This increase is driven by: (1) advances in technology (primarily the spread of low-cost, high-bandwidth telecommunications and the trend toward standardization of software platforms and applications); (2) shifts in work processes (digitalization of work functions, separability of routine or commodity functions from core activities); (3) emergence of new business models (sourcing as a means of cost efficiencies and strategic competitive advantage for customers, sourcing variations such as captive sourcing and nearshoring, and the rise of intermediary or support companies that aid both customer and provider firms); and (4) general globalization drivers (improvements in education and increases in graduates among developing countries, lowering of trade and work/immigration barriers, and growth of the "world market") [Aspray et al., 2006]. These factors dictate that IS skills will play a critical role in contributing to the success of global sourcing arrangements by enabling organizations to make efficacious use of available and emerging technology when responding to new developments in the global sourcing environment. These factors also enable firms to take advantage of labor arbitrage by shifting tasks and activities from high-wage countries to low-wage countries.

Previous research indicated that companies will increase their use of IS service providers to furnish some or all of their IT functions; and when using offshore workers, they will do so through domestic providers rather than work directly with an offshore firm [Zwieg et al., 2006]. This increase in outsourcing led us to focus on service providers to learn what skills they desire in their employees and if these skills varied by region; that is, what skills organizations in different parts of the world value the most in staffing their workforce. We propose that the nature of these skills would reflect different criteria influenced by national agenda as described in Carmel's Oval Model [Carmel, 2003a]. We assume that service provider firms not only recruit and retain employees who will best serve their clients, but also will search for those skills in various parts of the world. For example, although most people consider Infosys an Indian service provider, the company has development centers in Canada, China, Japan, several countries in Latin America, the United Kingdom, and the United States [Infosys, 2010].

For service provider firms looking to expand or more efficiently staff their workforce, an analysis of skills by region can assist in narrowing the scope of choices about where to locate development centers. For client firms choosing service providers, the analysis may help determine the feasibility of long-term relationships with provider firms no matter where their headquarters are located. The global delivery model promises to offer not only 24 x 7 follow-the-sun productivity but also skill availability in regions where the client firms may have multinational operations and sales.

### III. RESEARCH QUESTIONS

In this article we direct our attention to the managerial implications of global IS sourcing as they express themselves in IS workforce skill sets desired by managers. Our overarching research question asks:

*What IS workforce skills do providers feel are critical for success in global IS sourcing arrangements?*

In particular we also investigate:

- (1) What skills are most valued by providers?

- (2) How are skills valued differently by high-wage and low-wage providers?
- (3) How do high- and low-wage providers value skills for entry- and mid-level positions?

The article proceeds as follows. We review the literature relevant to skills and wage differences and then describe some basic IT skills. This is followed by the research methodology used in several phases of research that brought us to these issues. The next section describes how we classified high- and low-wage regions. Then we present results of skills critical to retain in house by global sourcing provider organizations by wage region and discuss what this means for talent managers, IS professionals' career development and academics for research and curriculum..

We are aware of no articles that discuss collected data about IS skills by region. There have been a number of country-specific studies that examine the characteristics of software industries within various countries. For example, reports on the software industries in countries such as Vietnam, Russia, The Ukraine, and Argentina have appeared in special issues of *The Electronic Journal of Information Systems in Developing Countries* [Carmel, 2003b] and *Information for Development* [Qureshi, 2005]. More recent research has examined the software industries of other countries such as China [Carmel et al., 2008], Costa Rica [Nicholson and Sahay, 2009], and India [Dibbern et al., 2008]. Most of these studies discuss the IS-related human resources within each country with emphasis on factors such as the size, educational background, and qualitative assessments regarding the strengths and weaknesses of software industry employees. Other than summarizing the educational backgrounds of those employed within the software industry, none of these studies provide empirical evidence regarding IT workforce skills or the skills needed by IT employers within each country.

**Global Wage Differences**

One measure often used to compare one country's economic circumstance with others is gross domestic product (GDP). Table 1 shows the GDP at purchasing power parity (PPP) per capita of a set of countries who are importers and exporters of information systems services. In ranking the data, the United States Central Intelligence Agency (CIA) [2011] shows France at thirty-ninth and the Czech Republic at fifty-fourth using 2010 estimates. This creates a significant gap where we separated high-wage and low-wage countries. The average PPP of the high-wage countries shown in Table 1 is USD38,100 and the average for the low-wage countries is USD10,088. PPP has been used in prior studies as an indicator of relative labor costs (global labor arbitrage) and a comparative price index [Gefen and Carmel, 2008; Lee and Tang, 2000; Lothian and Taylor, 1996].

<b>Table 1: Gross Domestic Product (GDP) at Purchasing Power Parity (PPP) per Capita of High- and Low-Wage Countries</b>	
Country	GDP (PPP) per capita USD <sup>1</sup>
<b>High</b>	
U.S.	47,200
Australia	41,000
Canada	39,400
Germany	35,700
France	33,100
<b>Low</b>	
Czech Republic	25,600
Russia	15,900
Chile	15,400
Belarus	13,600
Brazil	10,800
China	7,600
Ukraine	6,700
India	3,500
Pakistan	2,500

The World Bank [2011] classifies economies using 2009 gross net income (GNI) which is very consistent with the CIA data above. Its lowest "high" classification is over USD12,196 which places the Czech Republic in its high

<sup>1</sup> The United States Central Intelligence Agency compiled these estimates for 2010 (Central Intelligence Agency, 2011).

classification. We argue that the disparity between it and other “high” countries is more appropriate for us to classify it as low. The classification of the other high and low countries is consistent with the CIA and the World Bank.

There is no universal standard for gathering wage data about IT professionals so direct comparisons of salaries for IT workers in different countries is problematic. However, based on the differences in GDP and purchasing power parity, it seems reasonable to expect similar differences in IT salaries. The wide discrepancies between high-wage and low-wage countries illustrate the cost reduction argument for companies that choose workers in different countries.

As a rough estimate comparing IT salaries in several countries, Gartner has a series of reports on the following with ranges starting at entry level (with conversion to USD):

Ireland	34,600–96,000 [Tornbohm and Marriott, 2009]
Czech Republic	37,400–55,400 [Tramcere and Marriott, 2009]
Russia	19,000–27,000 [Marriott and Huntley, 2009]
India	12,000–17,000 [Iyengar et al., 2009]

For comparison, *ComputerWorld’s* 2011 Salary Survey of U.S. firms indicates that a help desk/technical support specialist would earn USD52,834 [ComputerWorld, 2011]. This has changed slightly from before the recession when the average U.S. entry-level salary in 2006 was USD49,194 [Neo Advisory, 2006]. Koh et al. [2010] offer summaries of twenty-nine countries to assess the quality of IT labor with some wage rates.

## IV. RESEARCH DESIGN

### Research Methodology Phase One—Clients

The initial research began in 2005, when the research team interviewed 104 senior IS executives from firms with locations in Asia, Europe, and the United States [Abraham et al., 2006]. All of the participating organizations were firms whose key business was providing non-IS goods and services (that is, products and services other than software, hardware, or IS services). We refer to these firms as *IS clients*, or simply *clients*.

Our focus was on the IS skills associated with entry-level and mid-level roles. For these roles, we investigated which skills are critical currently and in the future, which skills are expected to be retained in-house and which skills are expected to be sourced externally, and hiring expectations over the next few years. We found that these IS client organizations expected significant and changing skills to be provided from outside their organizations over the next few years. Firms of all sizes indicated an increase in sourcing, but large firms said they would be increasing the use of both domestic and offshore outsourcing. Thus this finding was a key driver for the focus of the second phase of our research, which focused on organizations that provide IS services to client firms. We refer to these types of firms as *IS service providers* or *providers*. The data were collected before the recent global economic downturn. It is reasonable to speculate that the economy has increased the efforts of IS client firms to reduce costs through domestic and offshore outsourcing.

### Research Methodology Phase Two—Providers

#### Sample

Based on the information garnered in Phase One, we developed an online questionnaire to gather data from IS provider business units. Respondents were solicited from the Society for Information Management (SIM), professional contacts of the researchers, and industry organizations such as NASSCom and RUSSOFT.

We identified respondents who determined or executed the human resource strategy; specifically we sought someone responsible for IS workforce strategy and recruiting plans. We actively expanded the range of countries of the respondents as compared with the first phase. We used snowball sampling [Berg, 2004] to solicit more responses by asking contacts for referrals to other organizations and respondents.

#### Type and Size of Service Provider

We were particularly interested in balancing the variable of size in addition to region so that there would be a distribution among sizes. Most discussion of providers is often limited to the large multinational organizations. Definition of size varies according to revenue (but qualified by industry). Over 99 percent of businesses in the United States [Small Business Administration, 2011] have fewer than 500 employees and the European Commission classifies 99 percent of European businesses as micro, small, and medium-sized enterprises (SMEs) [European Commission, 2005] based on headcount of fewer than 250 employees, turnover of 50m euro (USD72m), and

balance sheet total of 43m euro (USD62m). The Indian government classifies micro, small, and medium service enterprises as fewer than 5 crore (USD1m) [Development Commissioner, 2006]. We chose to categorize organization size according to revenue as Large  $\geq$ USD500M and SME  $<$ USD500M. This stratified sampling resulted in the following distribution in Table 2. We used revenue, but 80 percent of the firms in our sample are below USD500m and have fewer than 1000 employees. The table indicates size and the type of service that the organization primarily delivers. These classifications were chosen by the respondents from a list of possible types of providers as either (1) consulting services; (2) software services (software development, systems integration, maintenance, or packaged software implementation and support); or (3) infrastructure services (facilities management, network services, server and storage administration, or help desk services). Totals may not equal the total number of organizations or respondents because some respondents did not answer every question. The following table shows the breakdown of the 126 business units by industry and size. Smaller software services firms are almost half of the units. The predominance of smaller organizations reflects most businesses in the world.

**Table 2: Type of Service Provider by Revenue**

Type of Service	SME	Large	N	%
Consulting/contracting	26	8	34	27
Software services	58	24	82	65
Infrastructure	6	4	10	8
Total	90	36	126	100

Data were collected from late 2006 to mid-2007 from over 152 participants. We received usable responses from 126 participants. Almost three-quarters of our respondents (73 percent) were senior level managers or executives (CxO or above). The remaining 27 percent were middle managers. The respondents are well-seasoned veterans of the IS industry: 69 percent of them have over ten years of experience. Taken as a whole, this indicates that the respondents are well-entrenched in their firm's management structure and possess a wealth of experience in the IS industry.

#### Regional Classification

To reflect the global nature of the IS service industry, we solicited input from respondents at companies around the world. Headquarters location may not indicate where most employees work, so we asked the respondents about the location of the majority of the workers in their business unit. In most cases there was only one response per firm (that is, the unit is the company), but, because we specifically sought different input from many geographical regions, in some cases we received multiple responses from individual firms that had business units located in multiple locations. So there are some instances of multiple reporting units of the same firm. Therefore, we classify the responding unit by its region rather than where the company headquarters is located. Table 3 summarizes data about the reporting unit (not headquarters) with regard to the majority of its employees by geographic areas. It shows companies by size and summarizes high- and low-wage areas. There are sixty-nine firms where the majority of the employees are in high-wage areas (55 percent) and fifty-seven firms where the majority of employees are in low-wage areas (45 percent).

**Table 3: Distribution of Majority of Employees' Location by Reporting Unit**

Revenue	North Amer	West Eur	Aus	High Wage	Lat Am	East Eur	CIS	India Sub	China	Low Wage	Total
Large	19	2	2	<b>23</b>	1		1	10	1	<b>13</b>	<b>36</b>
SME	41	2	3	<b>46</b>	1	1	25	14	3	<b>44</b>	<b>90</b>
Total	60	4	5	<b>69</b>	2	1	26	24	4	<b>57</b>	<b>126</b>

Many of the reporting units are located in North America (sixty out of 126, or 48 percent) which reflects the majority of IT providers worldwide. Twenty six of the reporting units (20 percent) are located in the Commonwealth of Independent States (CIS—countries from the former Soviet Union) although almost all of these (twenty-five out of twenty-six) are SMEs. Even the largest Russian firm does not have the revenue or staff near the size of North American or Indian firms. The Indian subcontinent is well represented (twenty-five out of 126, or 20 percent) which mirrors the portion of global IT sourcing of India as the predominant exporter of IT services. The remaining firms have a small presence in various countries. There were no respondents from Africa or the Middle East.

We classified our responding units as being in regions where wages were either high or low. Developed economies are where most global sourcing clients are, which also happen to be high-wage regions. Less-developed economies are the typical locations where many client firms seek skills. These are the low-wage countries. The table above shows how we classified the respondents' regions and countries into high- or low-wage areas by the location of the



reporting unit. High-wage regions appear on the left and low-wage regions on the right. The next section describes the set of skills used in the research.

## V. IS SKILLS

Table 4 shows the list of skills identified for this Phase Two study, which were adapted from the Phase One skills list to include skills that would be appropriate for service provider organizations, e.g., Customer/Service Go-to-Market Strategy or Contracting and Legal. We presented participants with this list of skills and elicited their opinions regarding the nature of skills desired in IS professionals. The questions asked respondents to identify skills that are critical to retain in-house, along with skills considered important when hiring entry- and mid-level employees. Entry-level positions are defined here as those filled by recent university graduates, without significant practical experience, and mid-level as those with more than five years of experience. Responses were tallied and rank-ordered, and then subjected to further analysis.

**Table 4: IS Skills and Categories**

<b>TECHNICAL</b>
Systems Analysis
Systems Design
Programming
System Testing
Database Design / Management
IT Architecture/Standards
Voice/Data Telecommunications
Operating Systems
Server Hosting
Security
Mainframe/Legacy
Operations
Continuity/Disaster Recovery
Desktop Support/Help Desk
<b>PROJECT MANAGEMENT</b>
Project Planning, Budgeting and Scheduling
Project Risk Management
Negotiation
Project Leadership
User Relationship Management
Working with Virtual Teams
Working Globally
Capability Maturity Model Utilization
<b>BUSINESS DOMAIN</b>
Industry Knowledge
Company Specific Knowledge
Functional Area Process Knowledge
Business Process Design and Reengineering
Change Management/Organizational Readiness
Managing Stakeholder Expectations
Communication
<b>SOURCING-SELLING</b>
Customer/Service Go-to-Market Strategy
Customer Selection or Qualification
Contracting and Legal
Managing Customer Relationships
<b>SOURCING-BUYING</b>
Sourcing Strategy
Third-Party Provider Selection
Contracting and Legal
Managing Third Party Providers

Generally speaking, *technical* skills are commonly considered core to the IS profession. Programming, testing, operating systems, and database skills lay the groundwork for entrée to the field and are fundamental for the development of more advanced capabilities, such as systems analysis, systems design, and architecture.

Operational skills associated with computer and data center operations, server hosting, mainframe/legacy support, and continuity/disaster recovery are also technical in nature, as are security skills.

The other skills are often termed *nontechnical*, or soft skills. These are abilities that enable IS professionals to understand organizational and business problems and to develop and deliver effective solutions to those problems. We organize these into Project Management, Business Domain, and Sourcing skill categories.

- Project Management skills allow IS professionals to plan, organize, lead, and control activities and personnel involved with projects. With the increasing spread of global sourcing, projects are expanding to include multiple organizations and multiple locations, and quite often multiple languages and cultures.
- Business Domain skills are associated with understanding the business environment in terms of the company, the industry, and related business processes. They include company-specific knowledge, industry knowledge, the ability to understand, design, and reengineer business processes, and other skills necessary for successfully managing change.
- Sourcing skills are those which facilitate the sourcing arrangement between IS service providers and their clients. Some of these skills involve marketing the firm (selling) by providers and are very customer oriented. These cover market strategy, customer selection, contract/legal, and managing customer relationships. The remainder reflects a recent trend of second-tier sourcing; that is, some service providers are outsourcing or subcontracting portions of their contract with clients to other providers. These “buying skills” include formulating a sourcing strategy, selecting and managing the third-party providers, and contract/legal skills.

## VI. RESULTS

Responses to the skill questions were analyzed by first counting the number of times a skill was identified within each of the three response categories (skills that are critical to retain in house; skills that are important when hiring at the entry level; and skills that are important when hiring at the mid-level). This was done separately for firms in high-wage and low-wage regions. The tables that follow present the percent of respondents identifying a skill for each response category by dividing the number of responses to each question by the appropriate N for the category. All of the 126 respondents identified skills that were critical to retain in house.

Respondents were asked to identify skills that were important when hiring at the entry and midlevels only if their unit planned to hire at the level within the next year. Only 116 respondents indicated that their unit planned to hire at the entry level and only these respondents answered questions regarding important entry-level skills. Similarly, 121 respondents indicated that their units planned to hire at the mid-level and only this group answered the questions to indicate what skills were important when hiring at the mid-level. Out of the 116 entry-level responses, fifty-nine were from high-wage regions and fifty-seven were from low-wage regions. Of the 121 mid-level responses sixty-six and fifty-five were from high- and low-wage regions respectively.

In order to concentrate on the most important entry-level and mid-level skills, Tables 5, 6, and 7 present only the top ten skills for each category. Each skill's ranking within the top ten for firms from low-wage and high-wage countries also are shown in the tables.

### Critical Skills by Wage Region

Table 5 shows the critical skills to retain in house that were ranked in the top ten by managers from each region. The response percentages and ranks are shown separately for the high-wage or low-wage regions and are grouped by skill category. For example, Table 5 shows that 84 percent of respondents from high-wage countries identified IT architecture/standards as critical to retain in-house, while 88 percent of respondents from low-wage countries did the same. This skill was ranked as the seventh most important by firms in high-wage regions and as sixth most important in low-wage regions. There were more than ten skills identified by high-wage providers due to ties. If the rank value is blank, the item did not appear in the top ten for the region.

High- and low-wage providers have seven skills in common among their top ten most critical skills. Four of these are in the Project Management category, with one each in the Technical, Business Domain and Sourcing (selling) categories.

The most noticeable difference between the two groups is that providers from high-wage countries placed a greater number of Business Domain skills among the leading group of critical skills than did low-wage providers, with seven of their most critical skills in this category versus one for low-wage providers. Although part of this difference is due to high-wage providers having thirteen top-ten skills, there would still be more critical skills in this category if all of



**Table 5: Top Ten Skills Critical to Retain in House by Wage Region**

Skill Category	Skill	High Wage (n = 69)		Low Wage (n = 57)	
		Rank	%	Rank	%
Technical	IT Architecture/Standards	7-tie	84%	6-tie	88%
Project Management	Project Planning, Budgeting and Scheduling	5-tie	86%	4-tie	91%
Project Management	Project Risk Management	4	87%	1-tie	93%
Project Management	Project Leadership	2-tie	91%	6-tie	88%
Project Management	User Relationship Management	7-tie	84%	6-tie	88%
Project Management	Working with Virtual Teams		78%	6-tie	88%
Project Management	Working Globally		75%	1-tie	93%
Business Domain	Industry Knowledge	1	93%	1-tie	93%
Business Domain	Company Specific Knowledge	7-tie	84%		79%
Business Domain	Process Knowledge	2-tie	91%		82%
Business Domain	Business Process Reengineering	7-tie	84%		81%
Business Domain	Change Management/Org. Readiness	7-tie	84%		70%
Business Domain	Managing Stakeholder Expectations	5-tie	86%		74%
Business Domain	Communication	7-tie	84%		81%
Sourcing-Selling	Customer/Product/Service Market Strategy		80%	10	86%
Sourcing-Selling	Managing Customer Relationships	7-tie	84%	4-tie	91%

the skills found tied at the seventh place rank were omitted from Table 5. Despite the different number of Business Domain skills being highly ranked, providers from the two regions agree on the importance of industry knowledge. It was the highest ranked skill of all for both groups.

Providers from low-wage countries place somewhat greater emphasis on Project Management skills than did high-wage providers, with six of the leading critical skills in this category versus four skills for high-wage providers. Providers from both the high-wage and low-wage regions identify project planning, project risk management, project leadership and user relationship management among the most important critical skills. Providers from low-wage regions include two additional Project Management skills among their top-ten critical skills as follows: working with virtual teams and working globally.

The two other skill categories shown in Table 5 are Technical skills and Sourcing (selling) skills. Both groups included IT architecture/standards as the lone Technical skill among the leading critical skills. Providers from low-wage countries placed two Sourcing (selling) skills among the leading critical skills compared to one for high-wage providers. However, both groups identified the same Sourcing skill (customer relationship management) as a leading critical skill.

Some of the skills that were rated highly only by providers from high-wage regions support the providers' abilities to interact with clients. Both communication and managing stakeholder expectations would be important skills in building relationships with clients (note that in this instance communication refers to interpersonal and inter-organizational communication skills, not technical skills such as telecommunications). Generally speaking, these skills revolve around communicating with and managing expectations of parties involved in the sourcing arrangement.

On the other hand, the following skills are seen as critical by managers in low-wage regions but are not among the top-ten critical skills in high-wage locations: working with virtual teams, working globally, and marketing strategy. The first two skills reflect the need for providers in low-wage regions to work at great distance and to work collaboratively with geographically distributed teams. Emphasis on marketing strategy by low-wage providers suggests that marketing to offshore customers is a challenge for providers in these locations.

### Entry-Level Skills Desired by Wage Region

Table 6 shows the top-ten desired entry-level skills (including ties) arranged by skill category for the wage regions with their ranks and percentage of responses. Providers from the two regions have about the same number of skills in the Technical, Project Management and Business Domain skill categories and have six top-ten skills in common.

Providers from both regions indicate that programming and system testing are among the most desired Technical skills. This likely reflects the prevalence of coding and testing as major responsibilities of entry-level positions regardless of the region of their employing unit. It is interesting to note that although programming was ranked

**Table 6: Top Ten Desired Entry-Level Skills by Wage Region**

Skill Category	Skill	High Wage (n = 59)		Low Wage (n = 57)	
		Rank	%	Rank	%
Technical	Systems Analysis	3-tie	59%		42%
Technical	Programming	2	64%	1	91%
Technical	System Testing	7-tie	56%	2	68%
Technical	Database Design and Management		41%	8-tie	51%
Technical	Desktop Support/Help Desk	3-tie	59%		40%
Project Management	Project Planning, Budgeting, and Scheduling	3-tie	59%		47%
Project Management	Project Leadership		46%	8-tie	51%
Project Management	User Relationship Management	9	53%	10-tie	49%
Project Management	Working with Virtual Teams	10	49%	4-tie	58%
Business Domain	Industry Knowledge	6	58%	6	54%
Business Domain	Process Knowledge	7-tie	56%	4-tie	49%
Business Domain	Business Process Reengineering		47%	10-tie	49%
Business Domain	Communication	1	68%	3	60%
Sourcing–Selling	Managing Customer Relationships		47%	7	53%

number one and two by low-wage and high-wage providers respectively, the percent of low-wage providers that saw it as an important entry-level skill was much higher than for high-wage providers (91 percent vs. 64 percent). Programming was very important for both groups of providers, but was even more so for low-wage providers. This reinforces the popular perception that programming and coding comprises a large part of offshoring to low-cost regions.

Other Technical skills that are among the top ten are systems analysis and desktop support for high-wage providers and database design and management for low-wage providers. Desktop support/help desk support was identified as an important entry-level skill by a substantially higher proportion of high-wage providers than low-wage providers (59 percent vs. 40 percent). The high ranking given to desktop support/help desk may reflect that this may be a more typical assignment of entry-level employees of high-wage providers. The emphasis on systems analysis in high-wage regions supports the perception that firms located in these regions are engaged in more complex and high-value activities (e.g., custom development, systems integration) than are firms in low-wage regions.

The leading Project Management and Business Domain skills are relatively similar for providers from the two regions. In addition to both having three or four leading skills in each category in both regions, providers from the two regions placed two of the same Project Management skills (user relationship management and working with virtual teams) and three of the same Business Domain skills (industry knowledge, business process knowledge, and communication) among the group of leading entry-level skills. This suggests that there may not be much difference in the skills sought in these two categories by high-wage and low-wage providers. Finally, managing customer relationships was the only Sourcing skill identified as a leading entry-level skill by low-wage providers. All of the leading skills for high-wage providers were in the Technical, Project Management, and Business Domain categories.

Our data indicate that 89 percent of firms planning to employ the majority of their entry-level workers in low-wage areas were seeking to fill programming positions. Thus it comes as no surprise that they are much more interested in candidates with programming skills than those firms placing entry-level employees in high-wage regions. Firms seeking to employ new entry-level workers in low-wage regions also expressed greater interest (68 percent compared to 56 percent in high-wage regions) in testing skills (a strong complement to programming skills). Finally, firms hiring in low-wage regions attached much more importance to virtual team skills and working globally than did high-wage firms, an indicator of the spread of global sourcing. This validates that these firms are not engaged as much with their domestic clients as they are with exporting services.

### Mid-Level Skills by Wage Region

The top-ten desired mid-level skills are shown in Table 7. All of the leading mid-level skills for high-wage providers are in the Project Management and Business Domain categories, whereas, all but one of the leading skills for low-wage providers are in the Technical or Project Management categories. Providers from the two regions had five of the top skills in common.

Providers in low-wage regions place systems analysis, systems design, and IT architecture skills among the most important skills for mid-level employees. The emphasis on these skills suggests mid-level employees in low-wage

**Table 7: Top Ten Desired Mid-Level Skills by Wage Region**

Skill Category	Skill	High Wage (n = 66)		Low Wage (n = 55)	
		Rank	%	Rank	%
Technical	Systems Analysis		76%	7	82%
Technical	Systems Design		74%	8-tie	80%
Technical	IT Architecture/Standards		71%	8-tie	80%
Project Management	Project Planning, Budgeting, and Scheduling	1	95%	1-tie	87%
Project Management	Project Risk Management	5-tie	86%	4-tie	84%
Project Management	Negotiation	10	77%		78%
Project Management	Project Leadership	4	88%	1-tie	87%
Project Management	User Relationship Management	2-tie	91%	8-tie	80%
Project Management	Working with Virtual Teams		70%	4-tie	84%
Project Management	Working Globally		68%	4-tie	84%
Business Domain	Industry Knowledge	2-tie	91%		76%
Business Domain	Process Knowledge	5-tie	86%	1-tie	87%
Business Domain	Business Process Reengineering	8	80%		71%
Business Domain	Change Management/Org. Readiness	9	79%		62%
Business Domain	Communication	7	85%		76%

providers are involved in more complex and high-value activities (e.g., custom development, systems integration) than their entry-level counterparts. Although high-wage providers did not place these skills in the top ten, one skill (systems analysis) was seen as a leading Technical skill at the entry level only by high-wage providers. This further buttresses the perception that low-wage firms are striving to develop capabilities beyond those of basic commodity service offerings, but at this point lag behind their high-wage brethren who focus on hiring these capabilities at the entry level. One skill that was highly valued at the mid-level by low-wage providers that was not highly rated at either the entry or mid-level for high-wage providers was IT architecture/standards. Expertise in this area may enable low-wage providers to expand on their foundation of providing commodity software development services and products while at the same time establishing a foundation for expanding the scope and nature of their offerings in areas such as systems integration.

High-wage and low-wage providers emphasize Project Management skills at the mid-level to a similar extent with five and six of their most important skills appearing in this category respectively. Additionally, providers from the two regions have four highly ranked Project Management skills in common. Although this suggests great similarity in emphasis and specific project management skills sought, two Project Management skills that were highly rated only by low-wage providers focus on working with virtual teams and working globally. Thus, Project Management skills in low-wage providers tend to include skills needed for global collaboration.

Five of the leading mid-level skills for high-wage providers were in the Business Domain category, compared to just one for low-wage providers. The only Business Domain skill for low-wage providers shown in Table 7 was process knowledge and was ranked as one of the three skills tied for being the highest ranked skill for low-wage providers. However, the greater number of Business Domain skills seen as important by high-wage providers suggests that these skills are more highly valued by this group of providers when compared to the low-wage providers. In particular, both industry knowledge and change management/organizational readiness were seen as important mid-level skills by a higher proportion of high-wage providers than for low-wage providers. This along with the fact that half of the top-ten skills for high-wage providers were in the Business Domain category suggests a greater emphasis on these skills at the mid-level when compared to low-wage providers.

One overarching difference between high-wage and low-wage mid-level skills is the range between the top-rated skill and the tenth-rated skill. For high-wage regions it ranges from 95 percent (project planning, budgeting, and scheduling) to 77 percent (negotiation). The range for low-wage regions is much tighter, from 87 percent (project planning, budgeting, and scheduling, project leadership, and process knowledge) to 80 percent (systems design, IT architecture/standards, and user relationship management). This suggests that low-wage regions expect mid-level workers to have mastered a wide variety of skills across three categories (Technical, Project Management, and Business Domain), more so than high-wage regions. This arguably reflects the low-wage regions' ongoing evolution from commodity contractors to full-service providers.

**VII. DISCUSSION**

The results of the investigation about skills provide data-supported evidence to confirm what many practitioners have expressed anecdotally. The results also raise questions about the evolution of global sourcing, provider

recruiting practices in different regions, how universities prepare IS professionals, and how IS professionals manage their careers.

As an exploratory study of comparing regions, we have broken ground to lay the framework for further research. We will discuss the results as they relate to our earlier research questions but also propose specific venues for investigation.

### Critical Skills Desired by Providers

The first research question asked about what providers valued without regard to geography:

1. What skills are most valued by providers?

Differences in skills considered critical by managers in high-wage regions and skills considered critical by managers in low-wage regions reflect the evolving nature of global sourcing. Initially, low-wage providers primarily undertook low-level or commodity work, such as basic programming, routine software maintenance and testing, and elementary business processes. However, low-wage providers aspire to move up the value chain to provide higher value, and hence more profitable, services such as customized systems development and systems integration [Aspray et al., 2006]. Our findings reflect this trend, revealing that skills rated high by managers in both high- and low-wage regions are those associated with more advanced systems development requiring industry and process knowledge, as opposed to skills related to basic programming tasks or generic database administration. Other skills valued highly by both sets of managers include those related to planning and leading projects, nurturing relationships with clients, and designing systems. Taken as a whole, these skills indicate that global providers are seeking what has been termed hybrid skills, or multidimensional skills that blend technological expertise with a customer focus [Bullen et al., 2007].

One final item of interest is that high- and low-wage providers both value process knowledge highly, reflecting the growth of business process sourcing as an important aspect of global sourcing. Strong understanding of business processes would enhance IS professionals' ability to perform systems analysis and system design, which is also valued by both types of regional providers.

Toward the development of a theoretical framework we offer the following about provider skills in general:

Proposition 1A: Providers will prefer technical skills more than business functional area expertise skills.

Proposition 1B: Providers will prefer technical skills more than client firms will.

### Desired Provider Skills by Region

The second research question focuses on the differences between high- and low-wage regions:

2. How are skills valued differently by high-wage and low-wage providers?

Skills considered critical by managers in high-wage regions, but not critical by managers in low-wage regions, reflect the head start that the high-wage providers have. These firms seek skills that can be melded to enhance marketability and add value to the organization by facilitating communication and interaction with all parties involved in the systems development effort, both internal to their own firm and external to their clients. Firms in high-wage regions value communications skills because they often work on more complex projects—that is, projects involving more distinct entities, both at the client firms (e.g., business processes that cross functional/departmental lines) and internally within the provider firm (e.g., technical specialists in programming, database, telecommunications, along with account representatives, etc.).

Similarly, skills considered critical by managers in low-wage areas, but not critical by their high-wage counterparts, reflect the heritage of the low-wage providers. Programming skills remain critical for these providers, equipping them to deliver their core service. The other low-wage critical skills reflect the increasingly global nature of sourcing, requiring increased interaction between project team members on both the provider and client sides. Low-wage regions have not had the English-speaking skills and the educational and technology infrastructure for as long a time as high-wage regions have had to develop these skills. The cultural, political, and historical backgrounds of some regions are factors in why these regions may predominate as exporters of certain types of skills rather than other types of skills due to the impact on the educational system [Carmel, 2003a]. For example, the strong tradition of science, technology, engineering, and mathematics (STEM) disciplines in the CIS and its long history of early computing draws client firms with scientific computing needs. The British infrastructure of India and the nationalization of banks contributed to its stronger political and business alliances with Western Europe and North America not only with language but with democratic values. The fall of the Soviet Union has brought the CIS closer

to a democratic model, but its economic conditions have not flourished as have India's. On the other hand, India's costs are rising and it is threatened by terrorism as evidenced by attacks on Mumbai.

The point made in the previous paragraph—the importance of programming skills to low-wage providers, along with the low-wage providers' desire for skills that facilitate global interaction among the various involved entities—is seconded by our findings showing the skills considered critical for entry-level employees by low-wage providers. These skills (programming, systems testing, and working with virtual teams) help providers distribute work globally while taking advantage of regional labor arbitrage.

High-wage providers, on the other hand, seek entry-level employees with skills not considered critical by low-wage providers, particularly systems analysis and industry knowledge. Interestingly, high-wage providers also seek entry-level employees with help desk skills. While the first two skills fit in nicely with the high-wage providers' emphasis on more custom or value-added services, the desire for help desk skills does not. It could be that these providers use the help desk as an opportunity to assess new hires, to ground them in the corporate culture and way of doing things, and to train and develop them in the other critical skill areas. This position acts as a feeder to the IS pipeline. As noted earlier, desiring desktop support/help desk skills may also be a result of infrastructure support being a well-established service offering for domestic providers located in the high-wage regions, whereas for offshore providers located in the low-wage regions, providing a broad array of infrastructure services is a relatively new line of business. In general, providers from low-wage countries haven't developed the infrastructure services line of business to nearly the same extent as high-wage providers. Infrastructure services have long been an important component of the service portfolio of high-wage providers [Beulen et al., 2005; Hawk et al., 2009].

Since fifty of the low-wage provider units shown in Table 3 were located in the CIS and the Indian subcontinent, post-hoc analysis was performed to assess whether differences between low- and high-wage regions might derive from the unique characteristics of one of these two low-wage regions rather than from overall differences between high-wage and low-wage regions. The results for entry-level skills show no differences between CIS and Indian units; firms in these two regions are virtually identical in the skills sought at this level.

There were both similarities and differences between the CIS and Indian units when it came to skills that were critical to keep in house and skills sought at the mid-level. One striking similarity for these two subgroups is that units in each region place the same emphasis on project management skills. Units from the two subgroups have the same number of project management skills among highest ranked critical skills as well as among the highest ranked mid-level skills. There are some differences between units in these two subgroups in their emphasis on technical and business skills. CIS units place somewhat greater emphasis on technical skills in the rankings of both critical and mid-level skills, while Indian firms place somewhat greater emphasis than CIS firms in the rankings of critical and mid-level business skills. Despite these small differences, however, the overall differences between high- and low-wage units for these two skill categories hold true when comparing high-wage units to units from either the CIS or the Indian subcontinent.

To investigate further we have developed the following propositions as a result of our preliminary findings:

Proposition 2A: High-wage providers will prefer project management skills more than technical skills.

Proposition 2B: Low-wage providers will prefer technical skills more than business skills.

Proposition 2C: High-wage providers will prefer business skills more than low-wage providers will.

### **Desired Provider Skills by Level of Experience**

The third research question divides high- and low-wage providers with regard to level of experience.

3. How do high- and low-wage providers value skills for entry- and mid-level positions?

With regard to mid-level employees, high-wage providers again are looking for skills related to industry knowledge, in an attempt to offer more focused services. At the mid-level it is more likely that providers are seeking people with experience that is specialized in one industry. These findings confirm the value of provider firms establishing vertical industry niches such as health care rather than technology-based niches such as Oracle. In contrast, low-wage providers seek mid-level employees with systems analysis and systems design skills, reflecting their desire to move up the value chain to more value-added offerings.

In future studies researchers could test the following propositions to substantiate this exploratory investigation.

Proposition 3A: Low-wage providers will prefer technical skills for entry-level positions more than high-wage providers will.

Proposition 3B: High-wage providers will prefer project management skills for mid-level positions more than low-wage providers will.

Proposition 3C: Low-wage providers will prefer technical skills more than high-wage providers will.

Proposition 3D: High-wage providers will prefer project management skills more than low-wage providers will.

### **The Migration of Technical Skills**

Prior research indicates that global sourcing clients intend to contract out primarily technical skills [Zwieg et al., 2006]. However, our results show that IS providers, generally speaking, consider skills in other categories more critical than technical skills. This is especially true for high-wage firms, although low-wage firms do highly value programming skills. This preference for programming skills is a logical consequence of the low-wage providers' core business model: offering generic programming capabilities at a low price. Of more interest, however, is the question of why providers in general, and high-wage providers in particular, value nontechnical or client-facing skills higher than technical skills. Three possible explanations come to mind.

First, large U.S. firms are predicted to lead a movement toward greater globalisation of their IS functions, moving up the sourcing maturity curve by adopting a proactive strategic focus [Carmel and Agarwal, 2002]. Providing "high-value" work offers service providers opportunities for greater profits and allows providers offering these services to differentiate themselves from 'commodity' service providers [Niederman et al., 2006]. Our data confirm that this movement is underway. It is a transition from the bread-and-butter coding that precipitated use of offshore firms for year 2000 compliance.

A second factor in the desire of service providers for client-facing skills is the realisation that the same skills that prove valuable in providing services to their customers are also useful internally. They provide the same advantages that providers tout to their customers: faster response time, standardization of work processes, project management expertise, and the use of common software engineering methodologies and tools [Carmel and Agarwal, 2002].

Third, as IT professionals become knowledgeable in applying IT solutions to business problems, they learn to leverage their technical skills and enhance their contribution to the firm by integrating IT and business knowledge [Slaughter, 2009]. The emphasis on project management and business domain skills still depends on having a solid base of technical skills in order to make this transition. Management of service provider firms expect their staff to develop beyond programming expertise so their organizations can also develop beyond commodity work.

### **Self-Fulfilling Prophecy**

The accelerating trend toward global sourcing might conceivably result in a self-fulfilling prophecy. That is, as more and more IS work is shifted offshore, organizations may invest less in training and retaining IS professionals. Concurrently, young people making career decisions will turn away from those types of jobs that are more likely to be offshored. The unintended consequence will be forecasts of the North American and Western European IS industry shrinking, with subsequent predictions of job shortages and lack of career opportunities [Niederman et al., 2006]. This has profound implications for IS professionals and the academic community.

## **VIII. LIMITATIONS AND GENERALIZABILITY**

The response rate was high because we used a convenience sample involving direct contact with the person responsible for human resource IT strategy. Despite this, the Web survey collection explains some nonresponse in contrast to interviews. The data was collected in late 2006 through mid-2007, so it does not reflect the change in the economy which has inevitable impact on workforce demand. Nonetheless, the downturn is the aberration, and we believe that the results are generalizable across most stable economies.

Although the sample is geographically diverse, it would have been desirable to have achieved broader geographic representation. Within the high-wage subgroup for instance, it would have been good to have included more units from Western Europe. Although we are not aware of literature that allow us to predict significant differences between the skill needs of Western European units and those located in North America or Australia, we are not able to assess this possibility with the current sample. The sample includes two of the major offshoring destinations (the Indian subcontinent and CIS), but relatively few units from China or other locations such as Southeast Asia or South America. Even though the post hoc analysis indicated few differences between the CIS and Indian units and the overall low-wage sample, we cannot rule out the possibility that other low-wage regions might have greater differences with the overall low-wage findings. Given that no region is further along in moving up the value chain than India, however, we believe that the greater emphasis on technical skills and less emphasis on business skills among low-wage units would generalize to units from other low-wage regions.





## IX. IMPLICATIONS

### Implications for IS Professionals

#### Managerial Perspective

Insights from this research provide firms with improved ways to establish programs for employee recruitment and selection, training and development, and career progression programs. These programs can focus on building both technical and nontechnical skills, with a strong emphasis on solving problems for their clients, either internal or external. IBM, for example, has launched an initiative to develop twenty-first century skills for the IS workforce [IBM, 2009]. Referred to as Services, Science, Management, and Engineering (SSME), it is a multidisciplinary integration of technology, business, and customer management skills. Based on the notion that the global marketplace is increasingly becoming service-oriented, the emphasis is on integrating and leveraging established fields to nourish innovation and productivity in the global economy's service sector [Lanvin and Passman, 2008; Scheibe et al., 2006]. This speaks to the more nontechnical skills that were highly valued by providers in both high- and low-wage regions and at both entry- and mid-level. Interestingly, the nontechnical skills were more valued at entry-level by providers than by their clients. The responsibility of organizations to nurture career development raises the question: How can managers develop human resource strategies that meet the training needs of their employees so they can attain their career goals, as well as ensure the provider has a continuous pipeline of talent, no matter where the expertise is located? More attention to career paths can assist the transition from entry-level technical skills to the business and project management skills sought at mid-level. In view of a forthcoming shortage in some regions, firms with global locations may consider different career paths in different regions and relocating employees as a retention strategy. Matching these preferences with individuals is the challenge for human resource professionals who nurture their IT staff. This is much more viable with large companies who have established career development policies than it is for smaller firms. The IT worker shortage only exacerbates how carefully companies determine their needs and seek skills where they can.

#### Individual Perspective

For individuals interested in an IS career, the first step is obtaining a solid underpinning in basic technical and business skills. For individuals who have been in the workforce for a while, this may entail refresher courses or self-study to become familiar with recent technical advances and developments in the integration of technology and business (e.g., business processes). Focusing on technologies used in global sourcing should be particularly valuable. Examples might include telecommunications, databases, Web services, and cybersecurity. Nontechnical skills involving team building, communication, and interpersonal/intercultural relations should also be developed. [Aspray et al., 2006; IBM, 2009; Niederman et al., 2006]

For individuals desirous of working in high-wage regions, industry knowledge skills are helpful. Given the ongoing trend toward increased global sourcing, skills that facilitate interaction between business and technology groups and processes will become increasingly valuable. The general intent is for one to be perceived as a prized problem-solver.

The career path for IS professionals often begins with more technical roles and then progresses to more analytical and managerial roles. When combined with the growing trend toward global sourcing, this raises several intriguing questions: How does the shift in skills impact an individual's opportunities? How should IS professionals prepare for their next role with regard to career development? Individuals can enhance their marketability by gaining global experience either by physically relocating or volunteering to work with global teams whenever possible. The nature of projects lends itself to short-term relocation. Entry-level professionals are especially able to use the results of this research to broaden their options.

### Implications for Academics

#### Research

Global IS sourcing involves multiple diverse stakeholders and can be studied from multiple perspectives, including individual, organizational, and societal. Such a multifaceted phenomenon cries out for conceptual and theoretical viewpoints that depict the complex and interactive relationships between research levels and stakeholders. New research tools and measurement instruments are also needed. Additionally, given the dynamic nature of global IS sourcing, the temporal dimension should not be neglected. Tambe and Hitt [2010] suggest that research about more defined attributes of tasks can predict which jobs would be offshored. We have provided the groundwork for further defining these attributes. This research offers a set of skills and categorization that can be translated to tasks for future research.

## Pedagogy/Curriculum

To better reflect the state of the IS field and the increasing significance of global sourcing, universities should determine a strategy of core competencies for their programs and then gear curriculum to follow. Given the results of this study, IS programs in high-wage regions should continue to offer a strong base of foundational technical skills but perhaps limit required courses to only two programming courses (probably a programming language and DBMS) instead of three or four. Variations on this might include, for example, training in ERP implementation and integration, which calls for understanding programming structure but does not require proficiency in the source code of SAP or PeopleSoft. ERP implementation skills would lean heavily on project management and business process reengineering. Another possibility would be to offer courses in automated programming tools. Systems analysis and design courses should likewise be available. At the same time, courses in nontechnical skills should be developed. As the study's results indicate, employers are seeking these skills in their new hires. Indicative of this shift, the IS Model Curriculum Task Force recently dropped application development from the set of required core courses. The model had been North American-centric previously but suggests flexibility in curriculum design to address global needs [Topi et al., 2010]. The results of this study can help IS programs in different regions to determine their emphasis.

Many of the low-wage countries' educational systems have strong engineering and computer science bases. For organizations in these areas to transition to higher value services rather than supplying commodity skills, there is a need for more business-oriented programs. This can present a dilemma because it involves a significant shift in values and culture about education. It also may not be in the best interest for this shift if the nature of skills sought in these regions is the commodity skills of application development which lend themselves well to strong technical and software engineering training.

It is interesting, and potentially discouraging, to note that the IS business environment changes rapidly, while changes in educational institutions move at a much slower pace. We teach just-in-time inventory systems in business schools, but do not practice what we preach with respect to our students. The set of skills they are taught is often outdated when they reach the job market [Scheibe et al., 2006]. Thus insights from this research can be used to inform governmental institutions that determine public policy, especially with regard to education. Hopefully this will result in better decision making about allocation of resources and educational policies [Carmel, 2003a].

## X. CONCLUSION

The study provides initial evidence for some conclusions that have heretofore been only anecdotal. There has been limited research about providers and less about what skills they seek, let alone for comparisons of those in high- and low-wage regions. This article focuses on the skills that provider firms identify as critical to retain in house and, therefore, serve their clients. It further differentiates between entry- and mid-level skills, and between providers in high-wage and low-wage regions. The results indicate that there are differences in IT workforce skills desired between entry- and mid-level employees, and between high- and low-wage regions. The results also suggest that there is a movement among low-wage providers to move up the value chain by providing more value-added services.

Organizations, whether they are client or provider firms, can benefit from the results of this study by applying the mix of skills for consideration in redesigning staffing models and recruitment and selection. This contribution is timely as businesses around the world prepare to recover from a recession. The results offer options for career development programs to retain valuable professionals. Predictions of shortages make this research even more valuable to firms allocating skills and choosing providers accordingly to complement their in-house portfolio of skills.

The value of this research for academics includes curriculum/course development which varies depending on regional location. The results provide new information for directions of key areas of research, such as a focus on IT personnel and their skill development, staffing models, criteria for choosing providers, among many other topics. This research is one of few cross-world studies on the IT workforce and can encourage more multiregional data collections.

This article is an initial step in exploring these issues. It also highlights the need for further exploration of these and related issues. It offers researchers a rare opportunity to investigate an important growth area in information technology that is current, critical, and an evolving phenomenon with significant managerial and applied implications.

## REFERENCES

*Editor's Note:* The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
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